

Can.
Pam.

Drummond, Andrew I.

SOME STATISTICAL FEATURES
OF THE
FLORA OF ONTARIO & QUEBEC
AND A COMPARISON
WITH THOSE OF THE
UNITED STATES FLORA.
BY A. T. DRUMMOND.

SOME STATISTICAL FEATURES OF THE FLORA
OF ONTARIO AND QUEBEC,

AND A COMPARISON WITH THOSE OF THE UNITED STATES FLORA.

By A. T. DRUMMOND.

The recent issues by Prof. Gray of a fifth edition of his *Manual of Botany of the Northern United States* and by Mr. Horace Mann of a *Catalogue of the Phænogamous Plants of the United States east of the Mississippi*, have suggested the thought that with the materials for a flora of Ontario and Quebec, which have been for some years accumulating, the prominent statistical characteristics of our local vegetation might now be indicated with reasonable certainty, and a fair comparison instituted between them and those of the flora of the United States. That any statistics given will, in coming years, be altered in consequence of additions made to our flora, is certain. There is reason to believe that a considerable number of phænogamous and filicoid plants not at present known to occur within our geographical limits, will yet be detected there. Whilst, however, these statistics are not invested with absolute certainty, they can, I think, be regarded as fair general conclusions.

The works of Michaux, Pursh, Hooker, Torrey and Gray, etc., afford much information regarding the flora of this part of the continent, but since their publication our knowledge of it has been greatly extended. Foreign as well as provincial scientific journals have within the past few years contained valuable papers on the subject of Canadian botany. The institution of a society, whose special aim was the promotion of botanical research in our midst, infused for a time much interest in the study, and resulted in the accumulation of considerable material for a provincial flora. Some of the papers and catalogues were published in the society's 'Annals,' but many are still in manuscript. To these

latter, as well as to other catalogues in the hands of the editor of this journal, I have been permitted to have access, and from them have derived much aid in arriving at the results given hereafter.*

Endeavours have already been made to bring the flora of Ontario and Quebec into one connected view. The work of the Abbé Provancher, in the French language, which was published some years since, is upon an ample scale, and contains descriptions of the plants referred to in it, whilst the more recent brochure of the late Prof. Hubbert is simply an arranged catalogue, which was intended as the precursor of his contemplated Hand-book of the Canadian Flora. Prof. Hubbert's list, in addition to the results of his own collections, as well as of those of his correspondents, probably contains all previously published information bearing on the subject.

The views of authors, of course, vary considerably with regard to orders, genera and species; however, for the purposes of comparison with the flora of the United States, those of Prof. Gray, as expressed in the recent edition of his *Manual of Botany*, are here adopted. Further, it should be premised that only flowering and filicoid plants are referred to in this paper, our knowledge of the lower cryptogams being as yet too limited; and it should be added that when speaking of the Northern States and the United States or Union, no more extended geographical limits are intended than are kept in view in the *Manual* on the one hand and Mr. Mann's catalogue on the other.

The prominent features in the distribution of the plants of Quebec and Ontario have been indicated in another place. With regard to the nature of the flora of the United States, it may be, in a general way, said that in the eastern and central portions of the Northern States the vegetation embraces a mountain and a woodland flora, which, excluding the more southern

* In addition to the catalogues cited in the foot note to p. 406, vol. i. (new series) of this journal, I have had access to those of Dr. Thomas, of the Rivière-du-Loup flora, and Dr. J. Bell, of the Maintoulin Island flora; to the notes of Prof. Huicks on Toronto plants (through Prof. Hubbert), and to the elaborate lists of Dr. McLaggan and Mr. John Macoun, the former of whom collected in different sections of the provinces, but chiefly in the western peninsula, and the latter in the vicinity of Belleville.

forms, is similar to that of Ontario and Quebec; that as the Mississippi is approached there is a transition to a prairie flora in some districts, and in others to the flora of the western plains and wooded country; that along the Atlantic coast there is a maritime flora, some former members of which now occur in special inland localities; that the line of distribution of many of the United States plants has a north-westward trend; and that the Southern States have their semi-tropical species, many of which do not range as far as, whilst others extend within, the geographical limits of the Northern States. All these circumstances largely affect the number and character of the species in each region.

In our two Provinces there are representatives of one hundred and fourteen natural orders. Of these Magnoliaceæ, Melastomaceæ, Dipsacæ, Bignoniaceæ, Phytolaccaceæ, Lauraceæ, Ceratophyllaceæ, Platanaceæ, Amaryllidaceæ, Commelynaceæ, and Xyridaceæ, are, as far as known, confined to Ontario. No order is, however, peculiarly provincial; all have their representatives in the Northern States among the one hundred and thirty-two orders which embrace the flora of that section of the Union. It is nevertheless a not uninteresting circumstance that, although there are eighteen of these Northern States orders which have no place in our Provincial flora, they comprise only thirty-five species, most of which are Southern States forms.

The genera which have representatives in Ontario and Quebec number 575, of which 428 are dicotyledonous, 124 are monocotyledonous, and 23 comprise the filicoid plants.

Of indigenous genera five are unknown south of the Great Lakes. These are Cochlearia, Crepis, Armeria, Pleurogyne, and Elæagnus, each of which comprises a single species. Crepis and Elæagnus are, with us, only found along the upper lakes, and are probably entirely western in their distribution, whilst the remaining three are of semi-arctic range. In addition to the above there are some introduced genera, as Scabiosa, Tragopogon, Ajuga, and Borago, which apparently have not been noticed in the United States. Within the geographical limits of Prof. Gray's work are 834 genera, 631 of which are dicotyledonous, 175 monocotyledonous, and 28 are filicoid. There are thus 263 genera in the Northern States which are without either indigenous or introduced representatives in either Ontario or Quebec.

The relative numerical proportion of monocotyledonous and

dicotyledonous genera decreases from our section of the continent southward. Thus, in Ontario and Quebec monocotyledons are to dicotyledons as 1:3.46; in the Northern States as 1:3.61, and in the whole of the States east of the Mississippi as 1:4.13. The numerical relations of filicoid to phænogamous genera present much more marked differences. In the Provinces the proportion is as 1:24, whilst in the Northern States it is as 1:28.9.

The relative positions of the orders with respect to the number of genera in them vary to some, though not to any considerable, extent in the two countries. In the Northern States and the whole Union these relative positions are not much different. Compositæ and Graminæ, however, assume the precedence there in each case as well as here. Arranging the large orders represented in each country according to priority in point of number of included genera, the following results are presented:

In Ontario and Quebec.

Compositæ	56	Filices, Liliacæ and Umbelliferae, each	19
Graminæ	47	Cruciferae and Rosacæ, ...	17
Labiatae	24	Ranunculacæ and Scrophulariacæ, ..	15
Ericacæ	22	Orchidacæ	14
Leguminosæ	21	Caryophyllacæ	12

In Northern States.

Compositæ	86	Umbelliferae	27
Graminæ	67	Scrophulariacæ	25
Leguminosæ	39	Filices	22
Labiatae	33	Ranunculacæ and Cruciferae, each...	20
Liliacæ and Ericacæ, each	28	Rosacæ	18

Of the 576 genera in the two Provinces, 291 or rather more than one-half, are referable to the twelve orders which take precedence in the first of these lists. The aggregate of the genera in the second list barely attains the half of the whole number of genera which have representatives in these States.

The largest interest is of course invested in the species which occur within our geographical limits, and in the numerical relations of the orders and genera with regard to the species which they embrace. The details given with respect to them will be less wearisome.

Recent discoveries have confirmed the occurrence in Canada of several species whose previous claims to a place in our flora rested solely on the authority of Michaux or Pursh. I have therefore experienced a reluctance to exclude any of their species—unless the occurrence of the plant is very improbable—on the mere ground that it has not been noticed by subsequent observers. This reluctance is increased by the circumstance that the Lake Superior and lower St. Lawrence districts, where many, if not

most, of these species are supposed to occur, have received but a limited exploration. Though *Sabbatia gracilis*, *Utricularia subulata*, and *Ilex glabra* are probably errors, I have had no hesitation in admitting *Rhododendron maximum*, *Phlox maculata*, *Trichostema dichotomum*, *Andromeda tetragona*, and even *Gnaphalium sylvaticum*, which occurs in Labrador and may very well be found within our extreme north-eastern limits. The same course in admitting or rejecting species has been adopted with regard to other authors.

Special reference will hereafter be made to introduced plants. Here, in order to exhibit the mass of the vegetation of each country and the relative proportions which classes, orders and genera bear to one another with regard to the entire number of species which they include, both indigenous and introduced plants are, without distinction, embraced in the statistics of species now given.

As far as considerable care can extend the catalogue, there are 1,676 flowering and filicoid plants in Ontario and Quebec. Of these, 1,161 are referable to dicotyledonous, 450 to monocotyledonous, and 65 to filicoid species. Monocotyledons are thus to dicotyledons as 1:2.5, and to phænogams as 1:3.5. In the Northern States the relative numerical proportions are almost identical, and the extension of the comparison to the whole Union does not much alter them. The large number of monocotyledonous species is very remarkable, and evinces a climate and physical conditions very favourable to these plants. Again, filicoid plants are to phænogams in the Provinces as 1 to 25, whilst in the Northern States they are as 1 to 28.7.

Some facts of considerable interest are presented by the relations which the different orders bear to one another, and to flowering plants, with respect to the number of included species. In ten natural orders are grouped nearly one-half of our indigenous and introduced species, and eighteen orders represent about two-thirds of them. Another interesting feature which appears quite as conspicuous in the United States flora, is that Cyperaceæ, Graminæ, Orchidaceæ, and Liliaceæ embrace the greater portion of our endogenous plants. Again, in the United States, east of the Mississippi, the Compositæ number 1-7th, and the Cyperaceæ 1-11th of the entire phænogamous flora; whilst in the Provinces the same orders comprise nearly 1-9th and 1-11th, and in the Northern States 1-8th and 1-10th respectively. The

grasses bear very nearly the same relations to flowering plants—1 2th to 1-13th—in the three divisions of country mentioned. Among other orders there are some marked differences in the proportions as they are exhibited in the different geographical regions;—in some the species proportionably increase from Canada southward; in others, the reverse of this is the feature. The five examples cited below will illustrate these particulars:—

	<i>Ontario and Quebec.</i>	<i>Northern States.</i>	<i>United States.</i>
Leguminosæ	1-29th	1-21st	1-18th
Euphorbiacæ	1-95th	1-72nd	1-58th
Rosacæ	1-25th	1-32nd	1-40th
Cruciferae	1-31st	1-39th	1-49th
Ericacæ	1-34th	1-38th	1-43rd

Among the smaller orders there are instances quite as marked. Convolvulacæ increases from eight species within our limits to twenty-four in the Northern States, and forty-one in the whole Union; and the Malvaceæ are similarly augmented from eight to twenty-two and forty-four; whilst in Cupuliferæ the species, in which are sixteen, twenty-three, and thirty-one, respectively, the numbers proportionally diminish. These circumstances tend, of course, to indicate the well-known facts, that, whilst some of the orders mentioned are semi-tropical and southern temperate, others are more abundant in the northern temperate regions of America.

The number of species occurring within our limits in each of the large orders is indicated below. To admit of a comparison being more easily made, the numbers in the same orders in the United States are placed in parallel columns.

	<i>Ontario and Quebec.</i>	<i>Northern States.</i>	<i>United States.</i>
Compositæ	194	324	481
Cyperacæ	155	248	336
Graminæ	124	212	287
Rosacæ	65	81	92
Leguminosæ	55	120	199
Cruciferae	51	65	74
Ericacæ	47	68	84
Labiatae	47	76	108
Orchidacæ	46	57	71
Scrophulariacæ	44	66	94
Filices	44	57	76
Liliacæ	42	62	78
Caryophyllacæ	34	33	70
Polygonacæ	34	38	54
Umbelliferae	28	45	58

To somewhat complete the parallel drawn, it will be useful to bring to view the number of species in the more important genera of Ontario and Quebec and of the Northern States. To extend the comparison to the flora of the Southern States may diminish its interest, as many of the conspicuous genera there are

but scantily or not at all represented north of the Great Lakes or in the valley of the St. Lawrence. The carices, it will be observed, constitute nearly 1-14th of our flowering plants. The asters comprise thirty-one and the solidagos twenty-six species—the larger number in each case being in Ontario—and together form 1-28th of phænogams. The maximum development of these two genera is probably in the Northern States, but they do not there form so conspicuous a relation to the entire vegetation as, though they comprise seventy-eight species, they constitute but 1-33rd of the flowering plants. Along the northern banks of the lower St. Lawrence and among the Laurentide hills to the northward, the same genera are, in both number of species and individuals of each species, poorly represented; and in the effect which they elsewhere have upon the aspect of the shubby and herbaceous vegetation, they are replaced by *Cornus Canadensis* and *Vacciniums*.

Ontario and Quebec.

Carex	118
Aster	31
Solidago	26
Polygonum	19
Ranunculus and Juncus, each	18
Salix	17
Viola	16
Euphorbia and Habenaria, each	15
Panicum	14
Potamogeton and Rumex, each	13
Poa	12
Vaccinium	11

Northern States.

Carex	153
Aster	41
Solidago	37
Juncus	26
Potamogeton and Euphorbia, each	23
Polygonum	22
Cyperus and Scirpus, each	21
Panicum and Helianthus, each	20
Desmodium and Ranunculus, each	19
Habenaria	18
Quercus, Viola and Eleocharis, each	17

Common to Ontario and Quebec on the one hand, and to the Northern United States on the other, there are no less than 1,591 flowering and filicoid plants. Of these, 1,089 are dicotyledonous, 440 monocotyledonous, and 62 filicoid species. There are thus eighty-five species which are without representatives across the border. Of these, however, it should be specially observed nineteen are manifestly introduced, and there are therefore only sixty-six indigenous plants which, as between the two Provinces and the Northern States, are peculiar to the former. There is thus a very marked similarity between the floras of these two sections of country. The indigenous species referred to include the following:—

Anemone narcissiflora, L.
Thalictrum alpinum, L.
Ranunculus affinis, R. Br.
R. cardiophyllus, Hook.
Caltha natans, Pallas.
Aquilegia vulgaris, L.
Arabis patula, Graham sp.
A. brachycarpa, Torr. & Gray sp.
A. retrofracta, Graham.
Erysimum lanceolatum, R. Br.

Vesicaria arctica, Richn.
Draba hirta, L.
D. muralis, L.
Thlaspi montanum, L.
Cochlearia tridactylites, DC.
Arenaria arctica, Steven.
Linum perenne, L.
Astragalus Labradoricus, DC.
Dryas octopetala, L.
D. Drummondii, Hook.

Geum geniculatum, Michx.
Rubus arcticus, L.
Rosa stricta, Lindl.
Epilobium tetragonum, L.
Ribes oxyacanthoides, L.
Saxifraga Groenlandica, Hook.
S. nivalis, L.
Angelica lucida, L.
Sium latifolium, L.
Cornus suecica, L.
Nardosmia frigida, Hook.
Aster Lamarckianus, Nees.
A. cornuti, Nees.
Matricaria inodora, L.
Gnaphalium sylvaticum, L.
Antennaria Carpathica, R. Br.
Senecio canus, Hook.
Hieracium vulgatum, Fries.
Ciepis runcinata, T. & G.
Andromeda tetragona, L.
Ledum palustre, L.
Armeria vulgaris, L.
Penstemon gracilis, Nutt.

Pedicularis palustris, L.
Melampyrum pratense, L.
Mertensia Sibirica, Don.
M. pilosa, Don.
Gentiana acuta Mx. v. *stricta*, Hook.
Pleurogyne rotata, L.
Rumex acetosa, L.
R. domesticus, Hartm.
Eleagnus argentea, Ph.
Salix reticulata, L. var. *vestita*.
Alisma natans, Ph.
Echinodorus subulatus, Engel.
Iris tridentata, Ph.
Eriophorum capitatum, Host.
E. russeolum, Fries.
Carex Macounii, Dew.
Carex bicolor, Allioni.
C. ovata, Rudge.
Elymus Europæus, L.
Triticum Macounii, Dew.
Asplenium viride, Hudson.
Woodsia hyperborea, R. Br. *
Equisetum littorale, Kuhl.

A critical examination of the above catalogue suggests some remarks. *Ranunculus affinis* and *R. cardiophyllus* will by some authors be referred to *R. auricomus* Linn., which, however, is a known British-American plant, and is absent from the United States flora; *Geum geniculatum*, *Angelica lucida*, and *Aster cornuti* are species of which not much is known; *Carex Macounii* and *Triticum Macounii* were only discovered about two years since, and, when their range is more fully known, may be found to occur south of the lakes; *Sium latifolium* Prof. Gray rejects from his manual as erroneously applied to the broad-leaved form of *S. lineare* Michx., and here a similar mistake may probably have been made; and *Equisetum littorale* perhaps requires confirmation. Prof. Gray, again, in the manual, takes no notice of *Arabis brachycarpa*, which Torrey and Gray locate at Fort Gratiot, Michigan; of *Nardosmia frigida* (to which *N. sagittata* Hook. is referred) which, on Pursh's authority, occurs on the highest mountains of Vermont and New Hampshire; of *Ledum palustre*, whose occurrence in Vermont and Pennsylvania is mentioned by Beck; or of *Penstemon gracilis*, to which Wood gives a place in his flora, with Chicago as a locality. It should be further observed that *Matricaria inodora* is adventive though not native in Maine. *Aster borealis*, Prov., if a good species, and not a variety of *A. aestivus*, must be added to the list. If the twelve

*EDITOR'S NOTE.—My esteemed correspondent, the late Mr. Horace Mann, sent me specimens of this fern, collected by himself on Willoughby Mountain, Vermont. *Lycopodium alpinum*, long known as a Newfoundland plant, may be added to this list; it occurs on the north shore east of Point de Monts, and probably elsewhere. D. A. W.

species referred to be rejected from the catalogue, there still remain fifty-four species unrepresented in the Northern States.

In connection with the non-occurrence of these plants in the Northern States, their range becomes a subject of considerable interest. Speaking generally, some are of semi-arctic and boreal types, and only occur in the more northern or otherwise suitable stations; others are entirely western in their distribution; whilst there are a few which are sparingly distributed in the Provinces, or with whose range we have but a limited acquaintance. *Ranunculus affinis*, *Thalictrum alpinum*, *Vesicaria arctica*, *Cochlearia tridactylites*, *Saxifraga Greenlandica* and *S. nivalis* are peculiar to the arctic climate, and, with the exception of the *Ranunculus* and *Cochlearia*, are also denizens of the coasts of Greenland. *Arenaria arctica*, an interesting discovery of which was not long since made at Muskoka Lake, Ontario, by one of Prof. Hincks's students; *Dryas Drummondii*, a pretty species in the Gaspé collections of Dr. Bell; *Astragalus Labradoricus*, *Rubus arcticus* and *Pleurogyne rotata* are examples of a less arctic type, though the little *Arenaria* penetrates the polar regions beyond Whale Sound on the West Greenland coast. *Ribes oxycanthoides* is said by Torrey and Gray to occur throughout Canada; and *Caltha natans*, *Aquilegia vulgaris*, *Linum perenne*, *Rosa stricta*, *Matricaria inodora* and *Eleagnus argentea* are probably limited to the north western parts of Ontario, and may be looked for in the neighbouring districts of the Northern States.

ERRATA.

On page 431, 4th line from foot read, "268" in place "263."

On page 432, instead of "Of the 576 genera," read "Of the 575 genera."

On page 434, in the comparison made of the number of species in each of the large orders—instead of 33 species in the Northern States referable to Caryophyllaceæ, read 53.

On page 436, in Ontario and Quebec *Carex* should be stated to have 117, not 118 species, and to *Juncus* only 17 species should be referable.